MEASUREMENT OF MAN'S REASON.

How many are twice two? Twice ten? Easy enough to tell. How many are twice 17.648? Seven times that? Twelve times that? The mental operations required are those we have just been measuring, and we who have perceived in them the highest grade will succeed here the best. First attention to impression and sensation, then correctness, and finally, rapidity. All these tests to be recorded. Thus we may progress through mathematics, logic, philosophy, and so on to the end, practicing continually our first and fundamental rules of Attention, and Correctness of Impression, or Sensation.

The thoughtful man can follow this system out in detail, can perceive how it can be accomplished. I can see how, by the introduction of some such system, not only the average mental capacity or power of a nation or a people might be measured, the result announced in figures, and a comparison made with other nations; also that its use might tend to increase that capacity and power.

Such are the higher uses of Anthropometry. The human mental capacity *to understand* things is nearly allied to its capacity to *see* things. If one can be done I should not despair of the other. Whatever can be done with either must be by experiment directed by observation, Experiments must be repeated and the observations recorded. This means counting and measuring; and this applied to man is the Science of Anthropometry.

These are some of the possibilities of Anthropometry, but they are as yet far beyond the scientists of the United States.

We must content ourselves for the present with obtaining full, complete, and reliable tables of measurements of the physical peculiarities of the various races which inhabit our country. This should be our immediate contribution to the world's science.

MICROSCOPY.[1]

THE RETINA OF THE BIRD. — Cajal[2] recommends the method of Golgi for the study of the retina. He proceeds as follows:

[1] Edited by C. O. Whitman, Clark University, Worcester.

[2] Anat. Anz., iv., No. 4, Feb., 1889, p. 112.

The fresh retina is left for two or three days in a mixture consisting of

Bichromate of potassium (3 %) - - 4 parts
Osmic acid (1 %), - - - - - 1 part.

It is next placed in nitrate of silver solution (¾%) 24-30 hours. The sections are cleared in oil of cloves and mounted in damar.

CELL DIVISION.—Rabl[1] recommends the following method of preparation for the study of the caryokinetic phases in Triton.

The larvæ are treated with chloride of platinum ($\frac{1}{10}$ - $\frac{1}{8}$ %) 24 hours, then thoroughly washed in water, and slowly hardened in alcohol. The floor of the mouth and the gills are then cut out, stained in Delafield's hæmatoxylin, or Czokor's alum cochineal, *and examined in methyl alcohol.* In media of higher refractive index the finer details are not seen. The preparations last only for a few days.

DEMONSTRATION OF THE TONOPLAST.—Professor Vries[2] has shown that the vacuoles of plant cells represent organs with distinct and very resistant walls. In harmony with its function the wall is called the tonoplast. Aleuron granules are tonoplasts with their contents in a dried condition. The demonstration of the tonoplasts is accomplished by a 10% solution of nitric acid reddened with eosin. The method may prove useful in the case of animal as well as plant cells.

THE PRESERVATION OF ACTINIÆ.[3]—The preservation of Actiniæ in a suitable condition for future study is a matter of some difficulty, and has greatly hindered a thorough study of the group. The great difficulty experienced in killing the animals sufficiently rapidly to prevent contraction is the main obstacle, and the method of first producing torpor by the use of chloroform or nicotine, as practiced by the Hertwigs ('79), is tedious and not always successful. I was in hopes that good results might be obtained by the use of cocaine, but my experiments with it gave negative results. The success of any method depends greatly on the character of the form under

[1] Anat. Anz., iv., 1, Jan. 10, 1889, p. 30.

[2] Hugo de Vries, *Intracellular Pangenesis*, 1889, p. 150.

[3] J. Playfair McMurrich, Actiniaria of the Bahamas, Journ. Morph., iii., 1, p. 2, 1889.

treatment. Methods which will give good results with the Zoanthidæ, for instance, will yield failure quite as often as success with more contractile forms. For a collector who cannot give the time required for the proper carrying on of the narcotizing methods, my experience has led me to advise the following method of procedure. After the general characteristics —the coloration, presence or absence of tubercles, the dimensions, and such easily observable features—have been carefully noted with as much detail as possible, the animal is placed in a jar just wide enough to allow its complete expansion, and with just enough water to cover it when fully expanded. When this condition is reached, a glass syringe is filled with Perenyi's fluid, and this is suddenly and rapidly injected into the interior of the animal, the nozzle of the syringe having been quickly inserted into its mouth. At the same time, if possible, a quantity of the same fluid is poured over the animal, so that it is bathed without and within with a tolerably strong mixture of Perenyi's fluid. It is left to the action of the fluid for about half an hour, and is then to be treated successively with 50, 70 and 90 per cent. alcohol, care being taken to inject a considerable quantity of the spirits into the interior at each change.

Although considerable contraction usually results from this process, and although the color is, as a rule, almost destroyed, yet I think the distortion is less than that resulting from most other methods, and there is the great advantage that the parts are preserved in a satisfactory manner for future histological study. Dissection is possible, owing to the absence of the excessive brittleness which results from the use of chromic acid, encrusting or attached calcareous particles are dissolved, and sectioning of entire small forms may be practiced without the danger of ruining the knife, and lastly, there is no unpleasant precipitation of crystals as occurs from the use of corrosive sublimate when the subsequent washing has not been sufficiently prolonged.

THE PREPARATION OF BONE AND TEETH WITH THEIR SOFT PARTS.[1]—Dr. L. A. Weil takes only fresh, or nearly fresh teeth, and in order to allow reagents and stains to penetrate into the pulp cavity, divides the tooth immediately after extraction with a fret-saw, below the neck, into two or three

[1] *Internat. Monatschr. f. Anat. u. Physiol.*, v., 1888, Heft 1, *Journal Roy. Mc. Soc.*, 1888, Dec., p. 1042.

pieces, "allowing water to trickle over it the while." The pieces are then laid in concentrated sublimate solution for some time to fix the soft parts. After this they are washed in running water for about one hour, then placed in 30 per cent. spirit, which in twelve hours is changed to 50 per cent., again, after a similar period, to 70 per cent. Then, in order to remove the black sublimate precipitate, the teeth are laid for twelve hours in 90 per cent. spirit, to which 1.520 per cent. tincture of iodine has been added. The iodine is afterward removed by immersion in absolute alcohol until the teeth become white.

For staining, alcohol, or an aqueous solution of borax carmine, gave the best results. From the absolute alcohol the teeth are removed to running water from fifteen to thirty minutes, and then placed in the stain. In the aqueous solution of borax carmine they remain one or two, in the alcoholic two or three days. They are then transferred to acidulated 70 per cent. alcohol (alcohol 100 ccm., acid. muriat., 1.0) in which they remain, the aqueous ones stained at least twelve, the alcohol-stained ones twenty-four to thirty-six hours. This done they are immersed for about fifteen minutes in 90 per cent. alcohol, and then for half an hour in absolute alcohol, after which they are transferred to some etherial oil for twelve or more hours.

The oil is then quickly washed off the objects with pure xylol, and then they are placed for at least twenty-four hours in pure chloroform. After this they are passed into a solution of balsam in chloroform. The balsam is prepared by drying in a water bath, heated gradually up to 90°, for eight hours or more, until when cold the mass will crack like glass on being punctured. Of this balsam so much is added to the chloroform as to make a thin solution in which, as before mentioned, the teeth lie for twenty-four hours. After this time as much balsam is added to the solution as will dissolve. When no more balsam will dissolve, the teeth and a sufficiency of the balsam are poured into a vessel and heated up to 90° in a water bath, until the mass when cold should be as hard as glass. When the balsam is sufficiently set the teeth are carefully picked out, placed in a vice, and their discs are cut from them with a fret saw, water being allowed to trickle over them the while, and then they are ground in the usual way. The preparations are mounted in chloroform balsam.